REMARKS

By this Amendment, Claims 1, 2, 9, 10, 12 and 13 have been amended and Claims 15-18 have been cancelled, without prejudice, in response to a restriction requirement. Claims 1-14 are currently pending.

The Examiner did not consider the non-patent literature documents in the previously-filed Information Disclosure Statement because they were not properly cited in the PTO Form 1449A. To that end, Applicants have submitted a new Information Disclosure Statement (see attached Exhibit A), including the fee under 37 CFR §1.17(p), and copies of the non-patent literature. The bibliographic data about each of the non-patent literature documents is the best information known to Applicants. Applicants have contacted the corresponding businesses that issued these brochures in an effort to obtain the correct bibliographic data.

It should be noted that five of these same references were made of record in the prosecution of ASN 09/415,685 (now U.S. Patent No. 6,322,273 (Gentile, Jr.) and which is one of the patents listed in the PTO Form 1449A filed previously). It is from this prosecution history that Applicants obtained copies of five of the six non-patent literature documents. A copy of form PTO 1449 in that prosecution history is attached as Exhibit B and it is seen that the Examiner in that case did consider those references with no more information than was provided in the PTO Form 1449 originally filed in this application.

In view of the above, Applicants respectfully request that the enclosed references listed in PTO Form 1449 of Exhibit A be entered and considered in the present application.

The Examiner has objected to Claims 1, 2, 9, 10, 12 and 13 because of the use of the phrase "and/or" and antecedent basis with regard to Claim 12. To that end, Applicants have amended those claims accordingly and respectfully request that those objections be withdrawn.

The Examiner has rejected Claims 1-7 and 9-14 under 35 U.S.C. §102(b) as being unpatentable over U.S. Patent No. 6,173,993 (Shumard, et al., hereinafter "Shumard"). In particular, the Examiner

> In regards to claim 1, Shumard et al disclose a joint restraint assembly (10) for connecting pipe ends together, or to other objects, by gripping the outer surface of the pipe, the joint restraint assembly comprising:
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> a body (14) encircling the pipe, with the body having a plurality of cavities adjacent the pipe and at least one set of a corresponding plurality of threaded bores disposed through the body, each threaded bore of the at least one set of a corresponding plurality of threaded bores being in communication with a respective cavity;
>
> a segment (40) disposed within each of the cavities in the body, and configured to make contact between the body and the surface of the pipe so as to provide resistance to pipe pull-out in proportion to the mechanical or internal pressure loading applied to the pipe; and
>
> a threaded bolt (32) extending through each of the threaded bores to pre-load the respective segment into initial contact with the pipe surface.

Applicants respectfully disagree for the following reasons.

As discussed in the present application, the joint restraint assembly utilizes a segment-cavity configuration whereby a threaded bolt is used simply to pre-load the segment. As the mechanical and/or pressure loading increases, these forces are transmitted to the segment which, in turn, transmits these forces to a corner of the cavity, thereby creating a resistance in proportion to these

loading forces; in other words, as the loading which tends to pull the pipe out increases, the deeper the segment edge 16 penetrates into the pipe. This can be seen clearly in Fig. 5 whereby the segment 6 is providing the resistance in proportion to the mechanical and/or internal pressure loading. In particular,

> With this segment configuration, the function of the threaded bolt is reduced to pre-loading the segment against the pipe surface, at the time of assembly, sufficiently to resist handling loads and low levels of internal pipe pressure. Upon application of sufficient mechanical and/or internal pressure loading, a corner of the segment is caused to firmly contact an interior corner of the cavity, and the continued application of mechanical and/or internal pressure loading causes additional rotation of the segment between the interior corner of the cavity and the pipe surface. In doing so, the segment performs in a self-actuating manner where the force tending to cause the segment edge to penetrate deeper into the pipe surface **is proportional to the increase in mechanical and/or internal pressure loading. Accordingly, the entire length of the segment edge is caused to penetrate deeper into the pipe surface as required to resist the applied loading, well beyond the penetration achievable from the force applied by the threaded bolt alone or any prior art arrangement**.(emphasis added, Present Application, p. 10, lines 3- 20).

and

> Pipe pull-out load 17 is applied longitudinally to segment 6 through force vector component 20. The direction of force vector 19 is defined by the geometry between the penetrating segment edge 16 and pivot corner 12, and the magnitude of force vector 19 is dependent upon this angle and the magnitude of vector component 20. The radial component 21 of force vector 19 is similarly dependent on the geometric angle of force vector 19 and its magnitude. Accordingly, radial vector component 21 is also dependent on the magnitude of vector component 20 and, in turn, pull-out load 17. The radial vector component 21 causes the segment edge 16 to penetrate pipe surface 15. As a result, after overcoming the comparatively small pre-load provided by threaded bolt 7, the depth of penetration of segment edge 16 into pipe surface 15, and thus the ability to resist pipe pull-out load 17, **is directly proportional to the mechanical and/or internal pressure loading applied to the pipe – i.e., the mechanism is "self-actuating."** (emphasis added, Present Application, p. 13, lines 17-33).

In contrast, the joint restraint device of Schumard operates on the wedge principle; in fact, one of its main components, 40, is a "wedge." In the Background section of the present application (page 3, line 30 to page 4, line 21), the concept of wedge-type restraint assemblies is discussed along with the problems involved with their use. As discussed in that section, the bolt shoulder slides against the restraint body whereas in the Schumard device the bolt slides against the segment; but, in either case, these wedge-type restraint assemblies involve sliding motion against the bolt. The present invention, as specified in Claim 1, avoids the problems of these wedge-type restraints.

In particular, the Schumard joint restraint device 10 comprises a plurality of wedges 40 positioned in corresponding wedge pockets 34 of a annular body 14. A threaded bolt 32 (or 86) is then rotated/torqued to cause a first tooth 52, located on the bottom of the wedge 40, to bite into the pipe surface 56[1]. Increased mechanical or internal pressure loading causes the wedge 40 to move to the left (in Figs. 5-7) as the bottom surface 50 of the bolt 32 (or 86) slides up the wedge surface 48[2], pivoting the front surface 46 downward to drive a second tooth 54 (located on the bottom of the wedge 40) into the pipe surface 56[3]. However, as can be seen in Figs. 4-7 in Schumard, as the mechanical or internal pressure loading occurs and increases, the wedge 40 does not make contact

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[1]Schumard, col. 6, lines 35-37; Also, from a practical standpoint, if these wedges 40 have any significant circumferential length, as illustrated in the figures (similar to dotted line 76 in Fig. 8), the threaded bolt 32 (or 86) would not be capable of embedding the first knife edge of the tooth 52 into a pipe surface comprising a ductile iron material, although it, perhaps, may be capable of penetrating PVC or plastic pipe; the same would be true of the second knife edge of the tooth 54. The forces provided by the bolt 32 (or 86) are just not sufficient to embed a long tooth (i.e., a tooth length corresponding to the length of dotted line 76) into the surface of ductile iron.

[2]Schumard, col. 3, lines 29-30.

[3]Schumard, col. 7, lines 22-30.

with any corner, or even any sidewall[4], of the wedge pocket 34. Moreover, as the mechanical or internal pressure loading continues to increase, the Schumard device includes a stop 78 to prevent any further motion of the wedge 40:

> After the second tooth 54 is embedded in the pipe surface, further pivoting of the wedge 40 is inhibited, but the wedge 40 may still slide relative to the bolt 32 until interference with the front edge 78 of the groove 48 <u>prevents further motion</u>. (emphasis added, Schumard, col. 7, lines 30-35).

However, this *<u>teaches away</u>* from the present invention whereby resistance to pipe pull-out is in proportion to the mechanical or internal pressure loading applied to the pipe.

Thus, for all of these reasons, Applicants respectfully submit that Claim 1, as filed, is patentable over Schumard and respectfully request that the rejection be withdrawn.

Thus, for all of these reasons, Applicants respectfully submit that Schumard does not teach, nor even suggest, a joint restraint mechanism where the resistance to pipe pullout is in proportion to the applied pullout load, as specified by Claim 1. As such, Applicants respectfully request that the §102(b) rejection be withdrawn against Claim 1.

Claim 2 is dependent upon Claim 1 and is patentable for the same reasons. Furthermore, as discussed previously, the joint restraint assembly of the present invention utilizes a segment-cavity configuration whereby a threaded bolt is used simply to pre-load the segment. As the mechanical and/or pressure loading increases, these forces are transmitted to the segment which, in turn,

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[4] In fact, Schumard states that once the second tooth 54 is embedded into the pipe surface, **<u>further pivoting of the wedge 40 is inhibited</u>**, although the wedge 40 may still slide relative to the bolt 32 until interference with the front edge 78 of the groove 48 prevents further motion. Schumard, col. 7, lines 31-35.

transmits these forces to a corner of the cavity, thereby creating a resistance in proportion to these loading forces, while doing so *independently of the threaded bolt*. This can be seen clearly in Fig. 5 where the threaded bolt 7 no longer is in contact with the segment 6 which is providing the resistance in proportion to the mechanical and/or internal pressure loading. In particular,

> With this segment configuration, **the function of the threaded bolt is reduced to pre-loading the segment against the pipe surface**, at the time of assembly, sufficiently to resist handling loads and low levels of internal pipe pressure. Upon application of sufficient mechanical and/or internal pressure loading, a corner of the segment is caused to firmly contact an interior corner of the cavity, and the continued application of mechanical and/or internal pressure loading causes additional rotation of the segment between the interior corner of the cavity and the pipe surface. In doing so, the segment performs in a self-actuating manner where the force tending to cause the segment edge to penetrate deeper into the pipe surface is proportional to the increase in mechanical and/or internal pressure loading. Accordingly, the entire length of the segment edge is caused to penetrate deeper into the pipe surface as required to resist the applied loading, well beyond the penetration achievable from the force applied by the threaded bolt alone or any prior art arrangement. **The threaded bolt does not contribute to securing the joint restraint assembly onto the pipe during higher levels of loading** (emphasis added, Present Application, p. 10, lines 3-22).

and

> Pipe pull-out load 17 is applied longitudinally to segment 6 through force vector component 20. The direction of force vector 19 is defined by the geometry between the penetrating segment edge 16 and pivot corner 12, and the magnitude of force vector 19 is dependent upon this angle and the magnitude of vector component 20. The radial component 21 of force vector 19 is similarly dependent on the geometric angle of force vector 19 and its magnitude. Accordingly, radial vector component 21 is also dependent on the magnitude of vector component 20 and, in turn, pull-out load 17. The radial vector component 21 causes the segment edge 16 to penetrate pipe surface 15. As a result, after overcoming the comparatively small pre-load provided by threaded bolt 7, the depth of penetration of segment edge 16 into pipe surface 15, and thus the ability to resist pipe pull-out load 17, is directly proportional to the mechanical and/or internal pressure loading applied to the pipe – i.e., the mechanism is "self-actuating." **Under these conditions, the threaded bolt 7 no longer contributes to the ability of the joint restraint assembly to resist the pull-out load 17, and threaded bolt 7 is not subjected to pull-out load 17 or damage therefrom; note in Fig. 5 that the rounded end of the threaded bolt 7 is no longer in contact with the segment 6. Thus, the self-actuating feature of the segment**

> **6 operates independently of the threaded bolt 7**. (emphasis added, Present Application, p. 13, line 17 to page 14, line 4).

In contrast, as mentioned earlier, the Schumard joint restraint device 10 also utilizes a threaded bolt 32 (or 86), but unlike the present invention, this bolt 32 does *not* operate independently of the wedge 40 and, in fact, ends up carrying the loading forces. See Figs. 3-7 where the bolt end 50 maintains contact with the wedge 40 throughout the loading process. In addition, in the present invention, as mentioned earlier, the threaded bolt 7 is used to pre-load the segment 6 against the pipe; the bolt 7 is not used to cause the segment edge 16 to bite into the pipe surface but rather the mechanical and/or internal pressure loading causes the segment edge 16 to bite into the pipe. In contrast, the bolt 32 (or 86) of Schumard is rotated or torqued to drive the tooth 52 into the pipe surface 56[5]. Thus, the bolt 32 (or 86) of Schumard is used to embed the first tooth 52 into the pipe surface, and once the second tooth 54 is embedded into the pipe surface, then all of the forces from the wedge 40, applied through the teeth 52/54 are transmitted through the wedge 40 to the bolt 32 (or 86), resulting in bending the bolt. Therefore, for all of these reasons, Applicants submit that Schumard does not teach or suggest a joint restraint assembly that resists pipe pull-out at increasing levels of mechanical and/or internal pressure loading *independent of the threaded bolt*. As such, Applicants respectfully request that the §102(b) rejection be withdrawn against Claim 2.

Claim 3 is dependent upon Claim 1 and is patentable for the same reasons. In addition,

[5]Schumard, col. 6, lines 30-37.

once the teeth 52/54 of Schumard are embedded into the pipe surface, the wedge 40 is loaded almost in pure shear, *not compression*. In order for for the pipe to slip out of the Schumard joint assembly 10, all that is required is that the teeth 52/54 shear off the wedge 40. In contrast, in the present invention, the segment edge 16 and bulk of the segment 6 is loaded primarily in compression as indicated by the load path in Fig. 5, force vectors 19 and 22. Force vector 19 has two components, 20 and 21 that act at the same time, so force vector 20 cannot exist without force vector 21 and vice versa; thus, the net result is force vector 19, and that is not in a direction that would shear off the segment edge 16. As such, Applicants respectfully request that the §102(b) rejection be withdrawn against Claim 3.

Claim 4 is dependent upon Claim 3 and is patentable for the same reasons. As such, Applicants respectfully request that the §102(b) rejection be withdrawn against Claim 4[6].

Claim 5 is dependent upon Claim 4 and is patentable for the same reasons. Furthermore, Schumard does not teach nor suggest a relief angle in the range specified in Claim 5. In Schumard,

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[6] It should be noted that with respect to the second tooth 54, Schumard actually includes a means for ***preventing*** penetration of the second tooth 54 into pipe surface due to over-torquing:

> In a preferred embodiment of the present invention, the bottom surface 42 of the wedge 40 is tapered between the first tooth 52 and the rear surface 74 of the wedge 40 in order to form a bearing 76 that dissipates the actuation load of the bolt 32 on the wedge 40 over a relatively large area. After the first tooth 52 is fully embedded in the pipe surface 56, **the bearing 76 is seated against the pipe surface 56 such that over-torquing does not result in penetration of the second tooth 54 into the pipe surface 56**. (emphasis added, Schumard, col. 6, lines 50-58).

the teeth 52/54 are always loaded in shear as a result of a pipe pullout load and even with the relief angle shown in the teeth 52/54, the result is still that the teeth 52/54 are always loaded in shear. As such, Applicants respectfully request that the §102(b) rejection be withdrawn against Claim 5.

Claim 6 is dependent upon Claim 3 and is patentable for the same reasons. Furthermore, Schumard transfers the force from the wedge 40, through the bolt 32 (or 86), to the body 14 so that the forces from the wedges 40 are imparted to the body 14 at discrete locations of the bolts 32. In contrast, the present invention has the force being transmitted from the corner of the segment 6 into the interior corner 13 of the cavity 4 over a distance almost as long as the segment 6 is long. There is no contact in the center of the segment 6 where the bolt 7 is located. Furthermore, as stated previously, the Schumard device *acts dependently* on the bolt 32, *not independently* of the bolt 32. As also mentioned previously with respect to Schumard, when the pipe pull out loading is the maximum, (and as shown in Fig. 7 of Schumard), the end of the bolt is pressed against the front edge (stop) 78, resulting in the bolt 32 taking all of the loading (and possibly bending). As such, Applicants respectfully request that the §102(b) rejection be withdrawn against Claim 6.

Claim 7 is dependent upon Claim1 and is patentable for the same reasons. Furthermore, in the Schumard device the body 14 is not, as specified by Claim 7, *optimized to resist the forces imparted to it by contact with the segments* because the wedge 40 does not contact the body 14, as discussed previously. As such, Applicants respectfully request that the §102(b) rejection be withdrawn against Claim 7.

Claim 9 is dependent upon Claim 1 and is patentable for the same reasons. Furthermore, Claim 9 specifies a cam surface *that engages and rotates against the pipe surface to resist pipe pull-out at comparatively high levels of mechanical loading or internal pipe pressure in proportion to the loading*. In contrast, Schumard does not teach nor suggest a cam surface as specified . As such, Applicants respectfully request that the §102(b) rejection be withdrawn against Claim 9.

Claim 10 is dependent upon Claim 9 and is patentable for the same reasons. Furthermore, Claim 10 adds the feature to Claim 9 of the joint restraint assembly operating independent(ly) of the threaded bolts. As discussed earlier, Schumard discloses a joint restraint assembly that operates *dependent(ly)* on the bolts 32 (or 86). As such, Applicants respectfully request that the §102(b) rejection be withdrawn against Claim 10.

Claim 11 is dependent upon Claim 9 and is patentable for the same reasons. Furthermore, Claim 11 adds the feature to Claim 9 of the segment transmitting the load from the pipe to the body while loading the segment primarily in compression. As discussed earlier, Schumard discloses a joint restraint assembly whose wedge 40 operates in pure shear. As such, Applicants respectfully request that the §102(b) rejection be withdrawn against Claim 11.

Claim 12 is now dependent upon Claim 9 and is patentable for the same reasons. As such, Applicants respectfully request that the §102(b) rejection be withdrawn against Claim 12.

Claim 13 is dependent upon Claim 12 and is patentable for the same reasons. Furthermore, Claim 13 specifies a joint restraint assembly of Claim 12 that resists pipe pull-out at increasing levels of mechanical loading or internal pipe pressure is independent of said threaded bolts. As discussed

earlier, the Schumard joint restraint device 10 operates *dependently* on the bolt 32 (or 86). As such, Applicants respectfully request that the §102(b) rejection be withdrawn against Claim 13.

Claim 14 is dependent upon Claim 12 and is patentable for the same reasons. Furthermore, Claim 14 adds the feature to Claim 12 of the segment transmitting the load from the pipe to the body while loading the segment primarily in compression. As discussed earlier, Schumard discloses a joint restraint assembly whose wedge 40 operates in pure shear. As such, Applicants respectfully request that the §102(b) rejection be withdrawn against Claim 14.

The Examiner has rejected Claim 8 under 35 U.S.C. §103(a) as being unpatentable over Shumard in view of U.S. Patent No. 4,848,808 (Pannell, et al. hereinafter "Pannell"). In particular, the Examiner asserts that:

> In regards to Claim 8, Shumard et al discloses the claimed invention except for an elastomeric material positioned between each of the segments and their corresponding cavities, the elastomeric material disposing the segment in the cavity in an optimum position. Pannell et al teach an elastomeric material (170) positioned between each of the segments (210) and their corresponding cavities, the elastomeric material disposing the segment in the cavity in an optimum position, to graduate the effecting force of the sudden application of a sliding force (col. 4, lines 25-40). As Pannell et al relate to mechanical pipe joints utilizing pipe clamping systems, it would have been obvious to one having ordinary skill in the art at the time the invention was made to provide an elastomeric material positioned between each of the segments and their corresponding cavities, the elastomeric material disposing the segment in the cavity in an optimum position, to graduate the effecting force of the sudden application of a sliding force, as taught by Pannell et al.

Applicants respectfully disagree for the following reasons.

Claim 8 is dependent upon Claim 1 and is patentable for the same reasons. Furthermore,

Pannell discloses a mechanical pipe joint whereby a compressible gasket 170 protects a pipe restraining member 40 from sudden shock by tending to graduate any application of force to a second block 120 resulting from sudden forces acting in pipes 10/10A[7]. However, in contrast, in the present invention, the elastomeric material 29 does *not* absorb any force or graduate any force. Rather, as specified in Claim 8, the elastomeric material 29 disposes the segment "in said cavity in an optimum position for self-actuation or for retaining said segment in said cavity for shipping, handling and installation." Furthermore, Schumard already contains a shroud 60 that holds the respective wedges 40 in their respective wedge housings prior to installation[8]. Thus, there would be no incentive to add the compressible gasket 170 to pre-position the wedge 40 in the wedge pocket 34 if there already is a pre-positioning shroud 60 used by Schumard. As such, Applicants respectfully request that the §102(b) rejection be withdrawn against Claim 8.

For at least the reasons set forth above, it is respectfully submitted that the above-identified application is in condition for allowance. Favorable reconsideration and prompt allowance of the claims are respectfully requested.

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[7]Pannell, col. 4, lines 25-40.

[8]Schumard, col. 5, lines 43-50.

Should the Examiner believe that anything further is desirable in order to place the application in even better condition for allowance, the Examiner is invited to contact Applicants' undersigned attorney at the telephone number listed below.

Respectfully submitted,

CAESAR, RIVISE, BERNSTEIN,
COHEN & POKOTILOW, LTD.

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By Scott M. Slomowitz

Scott M. Slomowitz
Registration No. 39,032
Customer No. 03000
(215) 567-2010
Attorneys for Applicants

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